

THE FOREST

SILVICS

WALLOWA (IMNAHA)  
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## **GRAZING LANDS BY LIFE ZONES**

The range naturally falls into several belts or zones, each of which is characterized by a peculiar type of vegetation, as determined by conditions which are due principally to differences in elevation. Four such zones have been recognized, which, according to Merriam's classification, are designated as follows: The Transition Zone, characterized by the yellow pine; the Canadian Zone, characterized by the lodgepole pine; the Hudsonian Zone, characterized by the subalpine fir; and the Arctic Zone, characterized by the absence of forest growth.

The altitudinal limits of the different zones can not be definitely fixed, owing to the fact that altitude is not the direct factor but affects plant life only in as far as it affects the direct factors, the most important of which are temperature and moisture. As a rule, northerly and easterly exposures are cooler and moister than southerly exposures; consequently the types of vegetation found on different slopes of the same altitude are often strikingly different. Thus, in the lower altitudes one usually finds the south and west slopes occupied by yellow pine, to the entire exclusion of other tree species; but immediately on crossing over to the north or east slope, one is almost certain to find the Douglas fir and, in the moister situations, tamarack, lodgepole pine, and lowland fir. A deep, narrow canyon is usually cooler and more humid than a sunny slope or plateau at the same elevation, and for this reason the vegetation of a canyon is frequently similar to that of a more sunny situation a thousand feet higher. For instance, the lodgepole pine and lowland fir which normally grow above 4,500 feet, and even the Engelmann spruce which normally grows above 7,000 feet, frequently descend in moist canyons to less than 3,500 feet. So marked is the influence of exposure that conditions representing three different zones may sometimes be found on different slopes, within an altitudinal range of less than 500 feet; while such cases are rather unusual, it is not at all uncommon for areas of equal elevation, on opposite sides of the same ridge, to be classed in different zones. As a rule a north slope presents conditions similar to those of a south slope about 1,000 feet higher; a similar, though less marked difference exists between east and west slopes. Even under uniform topographical conditions the change in vegetation with a change in altitude is usually very gradual; therefore, when we consider the great variations in topography, it is evident that contiguous zones will necessarily overlap and intermix to a considerable extent, and that any attempt to fix the altitudinal limits of the different zones can only be approximate.

The average altitudes of the four zones in this region, as indicated by characteristic plants, particularly forest trees, are as follows:

Transition or Yellow Pine Zone	3,000 to 4,500 feet.
Canadian or Lodgepole Pine Zone	4,500 to 6,500 feet.
Hudsonian or Subalpine Fir Zone	6,000 to 8,500 feet.

## Arctic or Alpine Zone

8,000 to 9,500 feet.

The above figures, while not intended to locate exact boundary lines, do indicate in a general way the altitudinal portions of the different zones. Each zone represents a distinct set of physical conditions accompanied by a distinct type of vegetation, which, though interrupted by local variations, are characteristic of the zone as a whole.

In the following discussion, general types of grazing plants will be referred to under terms in use by stockmen. Unless more specific meanings are indicated, the term "grass" will be used to cover all grass-like plants, including true grasses, sedges, and rushes; the term "weeds" will include all non-grass-like, herbaceous plants; and the term "chaparral" will include all shrubs which form thickets.

## Transition or Yellow Pine Zone

This zone is confined to the lower altitudes of the Wallowa division, usually occupying only the lower canyons and the more sunny slopes. On canyon bottoms and north slopes it does not usually extend above 4,000 feet, but on south slopes it usually extends to about 5,000 feet.

Yellow pine (*Pinus ponderosa*) is the characteristic tree of the zone. This tree frequently occurs in pure stand on limited area, but in the moister situations it is mixed with such trees as the Douglas fir and tamarack, while in extremely dry situations it gives way to the grasses.

Since the grazing conditions in forests are considerably different from those of grasslands, these two types of range will be discussed under different heads.

### Forests

Only a small proportion of the Yellow Pine Zone is forested at the present time, the timber being confined principally to small areas of the lower, moist slopes and in canyons. Yellow pine (*Pinus ponderosa*) occurs in pure stand on limited areas, but there are no extensive yellow pine forests in the Wallowa division. The Douglas fir (*Pseudotsuga mucronata*) and the tamarack (*Larix occidentalis*), though less typical than the yellow pine, are common trees in the moister situations throughout the zone. Several broadleaf trees, among which are the quaking asp (*Populus tremuloides*) and a birch (*Betula fontinalis*), occur in deep canyons along the streams. Toward the upper limits of the zone, the lodgepole pine (*Pinus murrayana*) and lowland fir (*Abies grandis*) make their appearance, and as the altitude increases these species become more abundant until, when the Canadian Zone is reached, they are characteristic trees of the forest. The yellow pine forests, owing to their open character, frequently support a dense growth of grass, usually pine grass (*Calamagrostis suksdorfii*); in the denser mixed forests, however, the herbaceous growth is almost entirely of the succulent, broadleaved type. Fires have been very destructive in canyons and on moist slopes

where the stand is made up largely of fire-tender trees, but in the yellow pine forests the damage due to this cause has been less marked.

## Grasslands

The timberless areas are usually covered with a more or less dense growth of grass. These grasslands are an upward extension of the "bunchgrass prairies" typical of the lower portion of the Transition Zone. They are usually large in extent, often occupying the whole south and west sides of a ridge, with the exception of draws and moist benches which are usually timbered. Much of the grassland is probably too dry for forest growth. Timber is either entirely absent, or is represented only by a scattering of yellow pine. It is quite probable that portions of these areas were formerly timbered and that their present condition is the result of repeated fires; but when we consider the great fire resistance of yellow pine, the only tree which could be expected to occupy such situations, together with the absence of all indications of former forest growth, it seems fairly safe to assume that the bulk of these lands are natural grasslands unadapted to the growth of timber. The principal grasses occurring here are small bluegrass (*Poa sandbergii*), a wheatgrass (*Agropyron spicatum*) and blue bunchgrass (*Festuca ovina ingrata*).

## Canadian or Lodgepole Pine Zone

The average altitude of this zone is between 4,500 and 6,500 feet, the limits being about 500 feet below these figures on north slopes, and about 500 feet above on south slopes.

The intermixing of zones due to the complexity of physical conditions presented by a broken country is strikingly illustrated in this zone. As a specific example may be mentioned the rather unusual conditions existing on Bald Knob, a broad eminence about 15 miles southwest of the town of Wallowa. The "knob" rises about 400 feet above the ridge of which it is a part, reaching an altitude of 6,500 feet. The summit is rocky and naturally bare, save for a few scattered tufts of grass, mostly small bluegrass (*Poa sandbergii*). The steep southwest slope has a very dry, gravelly soil, with large patches of "scab land"; this slope is treeless down to from 500 to 600 ft. below the summit; the principal plants are small bluegrass, blue bunchgrass (*Festuca ovina ingrata*), yarrow (*Achillea lanulosa*) and *Clarkia pulchella*, all of which are typical plants of the Transition Zone. On a moderate west slope, a short distance south along the same ridge and at a slightly lower elevation, is a dense forest of lodgepole pine, the typical tree of the Canadian Zone. On the north and east slopes, beginning about 100 feet below the summit, the soil is still somewhat rocky and gravelly, as on the southwest slope, but apparently much cooler and moister, snowdrifts remaining here until the month of July. On these slopes we find a forest of subalpine fir (*Abies lasiocarpa*) and black hemlock (*Tsuga mertensiana*) both typical of the Hudsonian Zone. Here we have areas representing three zones, occupying different exposures, but all practically the same elevation.

The Lodgepole Pine Zone is the most heavily timbered of the four zones in this region. Lodgepole pine (*Pinus murrayana*) is the most characteristic tree, occurring throughout the zone. Other common trees are tamarack (*Larix occidentalis*), Douglas fir (*Pseudotsuga mucronata*) and lowland fir (*Abies grandis*). It is probable that practically all of the land in this zone was originally timbered, but fires have reduced the forest until now over one-half the area is open or only sparsely timbered.

The range may be divided into three general types, namely: Forests, burns, and grasslands. The second and, to a great extent, the third are really modifications of the first type; burns are the natural result of the destruction of the forest by fire, while many of the present grasslands are really old burns. In order to simplify the discussion, however, the lands will be classified according to their present state.

## **Forests**

The character and composition of the forests vary considerably with the situation. On north and east slopes and in canyons, the stand is usually rather dense, the principal species being lodgepole pine, Douglas fir, tamarack, and lowland fir. There is usually a large amount of undergrowth consisting mostly of lowland fir and Douglas fir with a good representation of subalpine fir and Engelmann spruce in the higher altitudes. A low shrub (*Pachistima myrsinites*) grows abundantly in the dense shade of these forests, but is not relished by sheep; the herbaceous growth in such situations is usually scant. A number of grasses and sedges occur in openings, the most common ones being pine-grass (*Calamagrostis suksdorfii*) and elk-grass (*Carex geyeri*), neither of which is of much value for grazing.

South and west slope forests are usually more open than those above described, owing to drier conditions and the greater prevalence of fires. The predominating trees are markedly less common here than on the north and east slopes. Young tree growth and shrubs similar to those of the north and east slopes are found in the more moist situations. Where the trees grow in open stand the ground is usually clothed with grass, approaching the conditions of the open grasslands.

A common type of forest is the lodgepole pine thicket. This tree comes in after fires, occupying almost any situation where the soil is not too dry, and forming very dense pure forests. Because of the great density of the stand, the soil is usually rather dry and the shade intense, with the result that both scrubby and herbaceous undergrowth are scant excepting in openings.

## **Burns**

The effects of fires vary with the soil and the character of the forest. The typical burns of this zone are in pure lodgepole pine forests. Here practically all of the trees are killed by a single fire, but are not destroyed. In a few years the dead trees are blown down, forming an almost impenetrable tangle. Abundant reproduction of lodgepole pine takes place in a few years, and unless another fire occurs the area becomes reforested. In

most cases, however, the first fire is soon followed by a second which consumes practically all of the down timber, and kills the young growth which has started. This clearing of the ground is usually followed by an abundant growth of weeds, of which the fire weed (*Chamaenerion angustifolium*) is a characteristic form. Grasses and sedges gradually gain a foothold, while tree reproduction is hindered by a number of causes of which the absence of seed trees, the dryness of the soil, and the recurrence of fires are probably the most common. In this way considerable areas of lodgepole pine forest have been converted into open grasslands.

In the mixed upland forests, typical of the drier slopes, the effects are somewhat different. Here the fire-tender species such as lodgepole pine and lowland fir are killed by the first severe fire, but the more fire-resistant species such as Douglas fir and tamarack are practically uninjured. A large proportion of the remaining trees are killed by subsequent fires, while others are blown down by the wind, but usually a few hardy Douglas firs survive. Grasses usually gain possession of the ground, but a scattering growth of trees may persist for many years, forming the characteristic open forest or wooded grassland.

In canyons and on moist shaded slopes the effects of fire are practically the same as in the pure lodgepole pine forest, as far as the destruction of the timber is concerned, but the final result is quite different. Forests of this type are composed largely of fire-tender species such as lodgepole pine and lowland fir; there is usually a mixture of the more fire-resistant Douglas fir and tamarack, but the latter, if they escape the fires, are usually thrown by the wind. While the killing of the timber, excepting in wet places, is just as complete as in the upland lodgepole pine forests, the more humid conditions here prevent a rapid destruction of the fallen trees by fire; logs may lie on the ground until destroyed by decay, with the result that the burned-over area becomes badly obstructed. Weeds grow luxuriantly, but grasses come in slowly. Tree reproduction, when not checked by fires, is abundant, and young trees grow rapidly. The most characteristic type of vegetation of these burns, however, is chaparral. The common chaparral species are alder (*Alnus sinuata*) and willow (*Salix nuttallii*), neither of which is much forage value. The more shade-enduring forest trees, such as Engelmann spruce and lowland fir, are common associates of the chaparral, and if undisturbed by fires will eventually suppress the latter. Where fires are as frequent as they have been here, however, chaparral easily resists the invasion of the forest trees, because the latter are killed by fires, while the former suffers little permanent injury from this cause.

The grazing value of burns naturally depends upon the character of the growth which follows the fire, and also upon whether the burned areas is cleared or left obstructed by down timber. Usually a fire opens the way for a luxuriant growth of weeds which may later be followed by grasses; frequently, however, grazing on such areas is practically impossible on account of down timber. Under certain conditions, a burn may grow up to chaparral. The grazing value of chaparral consists almost entirely in the herbaceous growth beneath the brush; where this is not too dense, the herbaceous growth is often abundant, and furnishes excellent feed for sheep; usually, however, the chaparral becomes so dense that sheep can not be driven through it. The proportion of burned-

over lands occupied by chaparral has not been determined, but it is known to be large. On the whole, fires have probably increased the total grazing capacity of the range in this zone, but this has been done at the expense of rendering large areas of timberland practically worthless even for grazing purposes, to say nothing of the destruction of the forest.

## Grasslands

The area occupied by grasslands in this zone is comparatively small. As already mentioned, the present grassland covered areas are to a great extent old burns, and therefore they might more properly be called "fire glades." Practically all of the small grassy areas in the upland forest are the result of fires. Of the grassy meadows occurring in canyons and basins, the drier ones usually show evidences of having been forested, but the typical wet meadows of these situations are undoubtedly natural grasslands. Occasionally we find large areas on steep, dry slopes, often at an elevation considerably over 7,000 feet, covered with a very dense growth of elk-grass (*Carex geyeri*) a rather inferior forage plant. While it is possible that areas of this type may at some time have been timbered, present indications lead to the opinion that they are natural grasslands unadapted to forest growth.

There seems to be no one grass which is especially characteristic of this zone. Among the more common species in "fire glades" are a rye-grass (*Elymus glaucus*), a bromo-grass (*Bromus marginatus*), needle-grass (*Stipa occidentalis*), and pine-grass (*Calamagrostis suksdorfii*) ranking, with respect to forage value, in the order named. In wet meadows we find the tufted hair-grass is readily eaten by all kinds of stock, but the sedges are too tough and coarse to be relished. Open, marshy situations, such as occur in the vicinity of springs, commonly produce a luxuriant growth of moisture-loving plants; common members of such associations are false hellebore (*Veratrum viride*), butterweed (*Senecio triangularis*), cone-flower (*Rudbeckia occidentalis*), monk's-hood (*Aconitum columbianum*), and larkspur (*Delphinium scopulorum*), all of which are of more or less forage value, excepting the monk's-hood and the larkspur which are poisonous.

## Hudsonian or Subalpine Fir Zone

The zone lies above the Lodgepole Pine Zone and extends to the tops of all but the highest mountains. The average elevation may be placed at from 6,000 to 8,000 feet on north slopes, and 7,000 to 9,000 feet on south slopes. The upper limit is marked by timber line, where such a line occurs. The crests of the ridges are frequently treeless, and for this reason they are sometimes spoken of as being above the timber line. The absence of timber on these ridges, however, is due to other causes than excessive altitude, since in most cases, they lie from 1,000 to 2,000 feet below the true timber line.

Subalpine fir (*Abies lasiocarpa*) is probably the most characteristic tree of the zone, being found in a great variety of situations almost to the upper limit of tree growth. Another, almost equally characteristic tree is the white bark pine (*Pinus albicaulis*)

which, though less common than the subalpine fir in the lower altitudes, reaches a higher elevation than the latter. The Engelmann spruce (*Picea engelmanni*) is a common tree, but its occurrence is determined more by moisture than by temperature.

The most striking features of the Subalpine Fir Zone in this region are the great preponderance of open lands and the general broken character of the forests. The range as a whole may be described as varying from open meadow to scattered woodland. Excepting on the lower moist slopes, where dense forests of subalpine fir, Engelmann spruce and mountain hemlock (*Tsuga mertensiana*) are found on limited areas, timber occurs only in scattered groups. The lower sunny slopes are usually covered with a luxuriant growth of mountain bunchgrass (*Festuca viridula*) interrupted in places by small, more or less scattered clumps of timber. The lower shaded slopes sometimes bear a good growth of grass, but more commonly they are timbered, while not infrequently they are practically bare of vegetation. Fires have undoubtedly played an important part in reducing the timbered area of this zone, but, owing to the infrequency of continuous forests, recent burns are usually limited in extent.

As we approach the high mountains of the Wallowa Range from the north, the vegetation becomes much sparser and of poorer development than that of the lower altitudes — a difference which is probably due in part to climatic conditions, but mainly to a difference in soil. In the lower altitudes the soil is mainly of basaltic origin, formed from volcanic material which had buried the older rocks to a depth of several thousand feet; but on the high peaks, which existed before the lava floods, the old rocks (mostly granite) were either not covered by lava at all or have since been exposed by erosion, with the result that the soils on these peaks are now largely of granitic origin. These granitic soils are usually poorly decomposed, and wherever they occur the vegetation is decidedly inferior to that of the basaltic soils. Whether the granitic soils are found only in the higher altitudes can not be stated, since only the region north of the Wallowa Mountains are covered in this study.

Probably the best range in the whole region is found on the lower basaltic slopes of this zone. By far the most important grass is the mountain bunchgrass (*Festuca viridula*). Another important grass, commonly associated with the mountain bunchgrass, is the mountain bluegrass (*Melica spectabilis*). Two common sedges, important because of their encroachment upon denuded bunchgrass lands, are *Carex deflexa* and *Carex hoodii*. In moist situations, particularly on the heavier soils, we find the mountain timothy (*Phleum alpinum*) and mountain redtop (*Agrostis rossae*) together with a greater variety of showy flowering plants among which are the shooting star (*Dodecatheon vulgare*) and two buttercups (*Ranunculus platyphyllus* and *Ranunculus glaberrimus*). The timber is usually sufficiently open to permit the growth of grasses and sedges, although the broadleaved plants constitute the greater part of the herbage in shaded situations.

As already mentioned, the vegetation of the higher altitudes is usually sparse. Occasionally good meadows of mountain bunchgrass (*Festuca viridula*) may be found on basaltic soils of the sunny slopes. Characteristic plants in the wetter situations are

the rushes, commonly called wire grass (*Juncus parryi* and *Juncoides glabratum*), and a large onion (*Allium validum*), all of which are eaten by sheep. Of the shrubby plants, two heathers (*Cassiope mertensiana* and *Phyllodoce empetrifomis*) are conspicuous on rocky slopes. As we approach timber line, the subalpine fir become trailing and finally disappears; the white bark pine takes on a straggling form, but persists to the tops of all but a few of the highest peaks where it marks the upper limit of tree growth.

### Arctic or Alpine Zone

This zone exists only in the high mountains, and even here it is generally confined to the shaded slopes. It lies above timber line, being characterized by the entire absence of tree growth. On southerly exposures, it begins at about 9,000 feet and extends to the summits of the highest peaks; on northerly exposures, it begins at about 7,500 feet and extends either to the summits of the peaks or to an altitude where perpetual snow renders ordinary plant growth impossible.

The vegetation as a rule is very scanty, and the plants are generally dwarfed. Among the grass-like plants occurring here are *Festuca ovina supina*, an alpine form of the common bunchgrass of the Subalpine Fir Zone, *Trisetum spicatum* and a sedge (*Carex preslii*). Other common plants are a buttercup (*Ranunculus Suksdorfii*), *Smelowskia calycina*, *Horkelia gordonii*, *Erigeron vineum* and two or three species of *Draba*.

The grazing areas in this zone are extremely limited.

**By G. A. Pearson, Forest Assistant; summer of 1907.**